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## Military Occupation and Deployment: Descriptive Epidemiology of Active Duty U.S. Army Men Evaluated for a Disability Discharge

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**ABSTRACT** Objective: Physically demanding jobs and history of deployment put Soldiers at increased risk for injury, hospitalizations, and disability. Characterizing differences in disability outcomes by occupation and deployment history may identify specific military populations for targeted prevention and intervention programs as well as potential areas of future research. Methods: A cross-sectional analysis was conducted on U.S. Army enlisted men evaluated in the Department of Defense's Disability Evaluation System (DES) between fiscal years 2005 and 2011, comparing those assigned a Combat Arms military occupational specialty (MOS) to individuals with any other MOS (Other). Results: Among deployed Soldiers, those with Combat Arms MOS were substantially and significantly more likely to receive medical disability retirement than Other MOS and were more likely to be evaluated for conditions compatible with combat exposures, including post-traumatic stress disorder, residuals of traumatic brain injury, and paralysis. Among nondeployed Soldiers, Combat Arms MOS were only slightly more likely to receive medical disability than Other MOS, and no substantial differences in medical conditions were noted between the two MOS groups. Conclusions: Combat Arms MOS is a significant risk factor for disability retirement primarily among deployed men. Further research is needed to identify specific military occupations most at risk for disability retirement.

### INTRODUCTION

The disability evaluation process within the U.S. Army includes both medical and administrative reviews to determine whether a Soldier's injury or illness is service-related and prevents the performance of military duties. From 1981 to 2005, the U.S. Army experienced substantial increases in disability evaluations, especially in young junior enlisted women.<sup>1</sup> In particular, rates of musculoskeletal-related disability and separation from service with severance pay (SWSP) rose during the study period.<sup>2</sup> Research on disability in the U.S. Army has historically centered on musculoskeletal-related disability, the most common type of disability among Soldiers.<sup>3–8</sup> Physically demanding jobs put Soldiers at increased risk for injury, including on-duty injury, hospitalizations, and disability.<sup>6</sup>

Analyses of Soldiers with work-related musculoskeletal disability found that back disorders to be most common and that occupations with heavy physical demands had the highest rates of back-related disability, especially infantrymen and heavy construction equipment operators.<sup>4,5</sup>

The impact of deployment to Iraq and Afghanistan on disability outcomes is an emerging area of research. Deployment to combat zones has been shown to be associated with psychiatric disability among U.S. Army personnel.<sup>9</sup> Analysis of post-traumatic stress disorder (PTSD) disability found that most PTSD-disabled veterans had both a history of deployment and disabilities considered combat related.<sup>10</sup> Predeployment medical conditions have been shown to be strong predictors of postdeployment medical problems, including hospitalizations, injuries, and mental disorders.<sup>11–14</sup> Several studies have examined the "healthy warrior effect" and deployment among military cohorts, with some limited findings that individuals who experienced combat deployments had overall better psychological health in particular.<sup>15,16</sup> However, no studies have investigated the combined effects of military occupation, deployment, and the various disability outcomes, such as disability disposition type, level of compensation, and diagnosis.

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There are over 200 occupational specialties for U.S. Army enlisted personnel, referred to as military occupational specialties (MOS).<sup>17</sup> Some MOS have exact or similar civilian counterparts (e.g., plumber and finance/accounting specialist), whereas others have no civilian analog (e.g., infantryman and cavalry scout). Based on the underlying general mission, most MOS can be categorized as either Combat Arms or Other MOS. The Combat Arms category includes Soldiers whose primary occupation is infantry, armor, field artillery, air defense artillery, Special Forces, or combat engineer.<sup>17</sup> Multiple studies have shown Combat Arms MOS to be associated with premature discharge during the basic training period.<sup>14</sup> Analysis of a small subset of Soldiers from a larger study of pre-enlistment risk factors for disability retirement showed that service in Combat Arms MOS was associated with increased risk of disability retirement among both deployers and nondeployers, but overall, a history of deployment was correlated with decreased risk of disability retirement in both Combat Arms and other support MOS.<sup>18</sup>

The primary objective of this study is to describe the relationship between occupation, deployment, and disability outcomes among U.S. Army men. This study analyzes disability disposition, medical disability retirement in particular, compensation, and disability diagnosis, comparing different occupational groups among deployed and nondeployed Soldiers. Characterizing differences in disability outcomes by occupation and deployment history may allow for identification of specific military populations for targeted prevention and intervention programs as well as needed areas of future research.

## **METHODS**

### **Study Design**

This study is a cross-sectional analysis of U.S. Army enlisted men evaluated in the Department of Defense's DES, comparing those assigned to a Combat Arms MOS to individuals with any other MOS (Other). This study was performed under a minimal risk human use protocol reviewed and approved by the Walter Reed Army Institute of Research Institutional Review Board.

The Army must assure the fitness of its Soldiers and provide fair compensation to those who can no longer continue military service because of an injury or illness incurred in the line of duty.<sup>19</sup> After severe illness or injury, Soldiers enter the DES when their physician sends his/her medical records to the Medical Evaluation Board (MEB), which determines whether the Soldier meets the medical retention standards for his/her branch, grade, and military occupation.<sup>20</sup> If the MEB concludes that the Soldier no longer meets retention standards, the case is sent to the Physical Evaluation Board, which formally determines the Soldier's fitness to continue military service and eligibility for disability compensation.<sup>20</sup> If the Soldier is found unfit and compensation eligible, the Physical Evaluation Board assigns disability codes and a disability disposition and determines whether the medical

condition was a result of armed conflict or during the preparation or training for armed conflict.<sup>19,20</sup>

Disability codes are derived from the Veteran's Administration Schedule for Rating Disabilities (VASRD).<sup>21</sup> The purpose of VASRD codes is to categorize the level of functional impairment to ascertain appropriate compensation.<sup>22</sup> Each VASRD code includes a mandated percent rating, reflecting the amount of compensation to which an individual is entitled, and is based on the severity of the condition.<sup>21</sup> A total percent rating is assigned to each Soldier, based on the combined percent ratings for assigned VASRD codes, ranging from 0% to 100% compensation. Disability dispositions include permanent disability or placement on the temporary disability retired list (Retired), SWSP, separated without benefits, or fit. Those with evaluations resulting in a combined percent rating of 30% or greater are eligible for temporary or permanent disability retirement. A rating ranging from 0% to 20% generally results in severance pay.

Specific VASRD codes are categorized into 16 broad condition groups generally based on the body system of the medical condition. Because VASRD codes were developed to rate and compensate disability conditions, they only roughly approximate International Classification of Diseases (ICD-9, 9th Revision) diagnosis codes and often cannot be cross-walked to a specific ICD-9 diagnosis code.<sup>22</sup> Therefore, body system categories of VASRD conditions are used in this analysis to approximate the type of medical condition that precipitated the disability evaluation. Previous studies of military personnel hospitalized before disability discharge have shown that the most prevalent ICD-9 codes in hospitalization records of service members who subsequently were evaluated for disability discharge were consistent with the body system group of the disability condition.<sup>22,23</sup> Prior research has also shown that the most common conditions evaluated for disability discharge from the military fall into the musculoskeletal, psychiatric, and neurological body system categories.<sup>22,24,25</sup>

### **Study Population**

All Army enlisted men who underwent an initial disability evaluation at the U.S. Army Physical Disability Agency between October 1, 2004 and September 30, 2011 were eligible for inclusion in this study. Subjects were excluded when missing a final disposition ( $n = 2,577$  subjects, 3.7%) or MOS ( $n = 18$  subjects, 0.03%).

### **Measures**

Data pertaining to disability evaluations were provided by the U.S. Army Physical Disability Agency and include demographic characteristics of the Soldier evaluated for disability, MEB date, MOS, disposition results and date, percent rating, and VASRD codes. Because Soldiers can be evaluated for a disability more than once, all demographic variables were derived from the record with the earliest disposition date, and final disposition, percent rating,

combat-related determination, and VASRD conditions were collected from the most recent disability record.

MOS at disability evaluation were categorized into Combat Arms and Other based on the MOS code's first three characters. If the first three characters of a Soldier's MOS code indicated that his occupation was infantry, combat engineering, field artillery, air defense artillery, Special Forces, or armor, his occupation was classified as "Combat Arms." All remaining MOS codes were classified as "Other."<sup>17</sup>

The Defense Manpower Data Center, Seaside, California, provided accession dates, separation dates, and deployment history for all study participants. Soldiers were classified as deployed if they were listed as deployed in the Defense Manpower Data Center's Contingency Tracking System. Length of service was calculated as the time elapsed, in years, from the first accession to the last discharge.

### Analysis

Means and standard deviations were calculated for average length of service in years and average number of unique condition codes. The Wilcoxon–Mann–Whitney test was used to compare length of deployment by MOS categories for both deployers and nondeployers. The study population's demographic and disability characteristics were described with frequency distributions, stratified by deployment status and MOS category. Chi square tests were conducted to compare the distribution of demographic and disability characteristics between Combat Arms and Other MOS among deployers and separately among nondeployers. Frequency distributions were also used to identify the most common conditions within the three most common disability body systems (musculoskeletal, psychiatric, and neurological) by deployment status and MOS category. Chi square tests were used to compare the distribution of the most common conditions between Combat Arms MOS versus Other MOS, com-

paring MOS separately in the deployed and nondeployed. Bivariate and multivariate logistic regression models were used to calculate crude and adjusted odds ratios (AORs) to assess associations between MOS category and medical retirement, stratified by deployment status. Adjusted OR are reported with the 95% confidence intervals (95% CIs) and control for age at first disability evaluation, race, and component; if the CI did not include the value of 1.00, it was considered statistically significant. All statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, North Carolina).

### RESULTS

The study population was predominantly white, active duty men under the age of 30 at the time of their first disability evaluation (Table I). For both deployed and nondeployed Soldiers, the distributions for all demographic variables were statistically comparing those with a Combat Arms MOS versus an Other MOS. Combat Arms MOS assignment was more common in the younger age groups. Among deployed Soldiers, 65% assigned Combat Arms were between the ages of 20 and 29 compared to 60% of nondeployed Combat Arms Soldiers. In contrast, 47% of deployed Soldiers and 46% of nondeployed Soldiers with Other MOS were between 20 and 29. Combat Arms assignment was also more common among white and active duty Soldiers.

The most common final disposition for deployed Soldiers, regardless of MOS category, was medical retirement, although more deployed Combat Arms Soldiers (53%) were medically retired than deployed Other MOS Soldiers (43%) (Table II). For those nondeployed, 59% of Combat Arms MOS and 50% of Other MOS Soldiers were SWSP. Approximately half of the deployed Combat Arms Soldiers had combat-related medical condition, but only 28% of deployed Other MOS conditions were considered combat-related.

**TABLE I.** Demographic Characteristics of the Study Population at First Disability Evaluation by MOS Category and Deployment Status

	Deployed					Nondeployed				
	Combat Arms (N = 17,327)		Other (N = 24,823)		$\chi^2$ (df)	Combat Arms (N = 7,356)		Other (N = 17,599)		$\chi^2$ (df)
	Count	Percentage	Count	Percentage		Count	Percentage	Count	Percentage	
Age at First Evaluation										
<20	85	0.5	58	0.2	1,893.9 (5)*	523	7.1	755	4.3	718.6 (5)*
20–24	5,604	32.3	4,736	19.1		2,925	39.8	4,789	27.2	
25–29	5,724	33.0	6,937	27.9		1,501	20.4	3,433	19.5	
30–34	2,676	15.4	4,510	18.2		816	11.1	2,384	13.6	
35–39	1,594	9.2	3,304	13.3		648	8.8	2,013	11.4	
≥40	1,644	9.5	5,278	21.3		943	12.8	4,225	24.0	
Race										
White	14,201	82.0	17,530	70.6	1,033.5 (2)*	6,070	82.5	12,475	70.9	395.8 (2)*
Black	1,550	8.9	5,076	20.5		822	11.2	3,715	21.1	
Other	1,574	9.1	2,212	8.9		462	6.3	1,402	8.0	
Component										
Active	15,244	88.0	20,169	81.2	343.9 (1)*	6,382	86.8	14,538	82.6	66.0 (1)*
Reserve	2,083	12.0	4,654	18.8		974	13.2	3,061	17.4	

df: Degrees of freedom, \* $p < 0.0001$ ,  $\chi^2$  test comparing Combat Arms to Other.

**TABLE II.** Characteristics of the Study Population at Last Disability Evaluation by MOS Category and Deployment Status

	Deployed					Nondeployed				
	Combat Arms ( <i>N</i> = 17,321)		Other ( <i>N</i> = 24,829)		$\chi^2$ (df)	Combat Arms ( <i>N</i> = 7,353)		Other ( <i>N</i> = 17,602)		$\chi^2$ (df)
	Count	Percentage	Count	Percentage		Count	Percentage	Count	Percentage	
Disposition										
Retired	9,107	52.6	10,766	43.4	680.3 (4)*	1,756	23.9	4,480	25.5	383.5 (4)*
SWSP	6,693	38.6	10,060	40.5		4,309	58.6	8,860	50.3	
SWOB	255	1.5	377	1.5		546	7.5	912	5.2	
Fit	562	3.2	1,903	7.7		195	2.6	1,160	6.6	
Other <sup>c</sup>	704	4.1	1,723	6.9		547	7.4	2,190	12.4	
Percent Rating										
<30	7,762	44.8	13,001	52.4	513.0 (2)*	5,232	71.2	11,462	65.1	157.0 (2)*
≥30	9,226	53.3	10,746	43.3		1,729	23.5	4,408	25.0	
Missing	333	1.9	1,082	4.4		392	5.3	1,732	9.8	
Combat Related										
Yes	8,941	51.6	6,861	27.6	2,505.6 (2)*	350	4.8	378	2.2	126.8 (2)*
No	8,376	48.4	17,954	72.3		6,997	95.2	17,217	97.8	
Missing	4	0.02	14	0.1		6	0.1	7	0.04	
Length of Service										
<i>N</i>	11,155		14,023		-13.1* <sup>b</sup>	4,824		10,265		-18.2* <sup>b</sup>
Mean (SD)	4.9 (2.2)		5.3 (2.3)			2.5 (1.8)		3.1 (2.1)		
Number of Medical Codes <sup>a</sup>										
<i>N</i>	16,413		21,822		10.0* <sup>b</sup>	6,752		14,666		-7.1* <sup>b</sup>
Mean (SD)	1.8 (1.1)		1.7 (1.0)			1.3 (0.7)		1.4 (0.8)		

SWOB: Separated without benefits; df: Degrees of freedom; \* $p < 0.0001$ ;  $\chi^2$  test comparing Combat Arms to Other. <sup>a</sup>Analogous VASRD codes are not included in this calculation. <sup>b</sup>Z-statistic generated from Wilcoxon–Mann–Whitney test comparing Combat Arms to Other. <sup>c</sup>Other includes administrative termination and transferred to the retired reserve.

Nearly all of the medical conditions were noncombat related for nondeployed Combat Arms and Other MOS Soldiers. Regardless of deployment status, length of service was significantly longer in those with Other MOS than with Combat Arms. However, deployed Soldiers had a longer term of service on average (Combat Arms: 4.9 years; Other: 5.3 years) than nondeployed Soldiers (Combat Arms 2.5 years; Other: 3.1 years). For both MOS groups, deployed Soldiers on average had significantly more medical conditions when compared to those never deployed (1.75 versus 1.35 conditions).

The three most common disability conditions within the musculoskeletal, psychiatric, and neurological body systems were similar for both deployed and nondeployed Combat Arms and Other MOS Soldiers (Table III). Approximately 60% of deployed and nondeployed Soldiers in both MOS categories had a musculoskeletal condition, most commonly arthritis or a back-related condition, but substantially more deployed Soldiers had neurological and psychiatric conditions than nondeployed Soldiers. Deployed Combat Arms Soldiers were more likely to have VASRD codes that are compatible with combat injuries than Other MOS Soldiers, including PTSD (31.2% versus 20.2%), residuals of traumatic brain injury (TBI) (9.9% versus 4.4%), and paralysis (6.4% versus 4.1%). Among nondeployed Soldiers, however, there were no substantial differences in the frequency of any of the VASRD codes for any specific condition.

After controlling for race, age, and component, deployed Soldiers with a Combat Arms MOS had an OR of 1.61 (95%

CI: 1.55–1.68) for being medically retired, compared to deployed Other MOS Soldiers (Table IV). For those never deployed, Combat Arms Soldiers were slightly but significantly more likely to be medically retired, with OR = 1.10 (95% CI: 1.03–1.17). Among deployed Soldiers, certain demographic characteristics were also associated with increased likelihood of disability retirement, including older age, white race, and active duty component. The same patterns were seen for nondeployed Soldiers, with the exception of race where no significant difference in the odds of disability retirement was observed between white and black race. Logistic regression analysis also showed that a history of deployment was predictive of disability retirement with an OR of 2.51 (95% CI: 2.43, 2.61), after controlling for age, race, and component.

## DISCUSSION

This study examined the relationship between occupation and disability evaluation in the U.S. Army, exploring deployment, demographic, and disability-related variables. Among both deployed and nondeployed men, Combat Arms Soldiers tended to be younger, of white race, and active component. Among deployed Soldiers, those with a Combat Arms MOS were substantially and significantly more likely to receive a medical disability retirement than Other MOS; among nondeployed, the relationship was much weaker but still statistically significant. The prevalence of musculoskeletal disability evaluation was similar regardless of whether a Soldier

**TABLE III.** Most Common Disability Body Systems and Disability Conditions at Last Disability Evaluation by MOS Category and Deployment Status

	Deployed				
	Combat Arms			Other	
	Count	Percentage		Count	Percentage
Musculoskeletal Conditions	10,663	61.6		15,274	61.5
Dorsopathies*	5,229	30.2	Dorsopathies*	8,612	34.7
Arthritis**	3,451	19.9	Arthritis**	5,287	21.3
Limitation of Motion (Arthropathies)*	2,118	12.2	Limitation of Motion (Arthropathies)*	2,624	10.6
Psychiatric Conditions	6,865	39.6		7,381	29.7
PTSD*	5,413	31.2	PTSD*	5,018	20.2
Mood Disorder*	767	4.4	Mood Disorder*	1,347	5.4
Anxiety Disorder	493	2.8	Anxiety Disorder	693	2.8
Neurological Conditions	3,891	22.5		3,860	15.5
Residuals of TBI*	1,710	9.9	Residuals of TBI*	1,101	4.4
Paralysis*	1,100	6.4	Paralysis*	1,013	4.1
Migraine***	540	3.1	Migraine***	687	2.8
Total Individuals	17,321		Total Individuals	24,829	
	Nondeployed				
	Combat Arms			Other	
	Count	Percentage (%)		Count	Percentage (%)
Musculoskeletal Conditions	4,739	64.4		10,670	60.6
Arthritis*	1,925	26.2	Dorsopathies*	4,869	27.7
Dorsopathies*	1,704	23.2	Arthritis*	4,034	22.9
Limitation of Motion (Arthropathies)**	864	11.7	Limitation of Motion (Arthropathies)**	1,793	10.2
Neurological Conditions	1,033	14.0		2,169	12.3
Paralysis	293	4.0	Paralysis	622	3.5
Neuralgia***	211	2.9	Neuralgia***	387	2.2
Residuals of TBI*	150	2.0	Migraine	331	1.9
Psychiatric Conditions	689	9.4		1,582	9.0
Mood Disorder	305	4.2	Mood Disorder	759	4.3
Dementia***	114	1.6	Dementia***	212	1.2
PTSD	78	1.1	PTSD	170	1.0
Total Individuals	7,353		Total Individuals	17,602	

\* $p < 0.0001$ , \*\* $p < 0.001$ , \*\*\* $p < 0.05$ ,  $\chi^2$  test comparing Combat Arms to Other.

**TABLE IV.** Unadjusted and AORs for Medical Retirement by Deployment Status

	Deployed				Nondeployed			
	OR	95% CI	AOR	95% CI	OR	95% CI	AOR	95% CI
MOS Category								
Combat Arms	1.45	1.39–1.51	1.61	1.55–1.68	0.92	0.86–0.98	1.10	1.03–1.17
Other	1.00	—	1.00	—	1.00	—	1.00	—
Age								
<20	0.70	0.47–1.04	0.68	0.46–1.01	0.46	0.37–0.57	0.45	0.36–0.56
20–24	1.00	—	1.00	—	1.00	—	1.00	—
25–29	1.64	1.55–1.73	1.73	1.64–1.83	1.65	1.51–1.81	1.65	1.51–1.81
30–34	1.79	1.68–1.91	1.96	1.84–2.08	2.40	2.18–2.64	2.38	2.16–2.63
35–39	1.75	1.63–1.87	1.93	1.80–2.07	2.77	2.50–3.06	2.68	2.42–2.97
≥40	2.13	2.00–2.27	2.34	2.19–2.51	2.78	2.55–3.02	2.57	2.35–2.81
Race								
White	1.00	—	1.00	—	1.00	—	1.00	—
Black	0.79	0.75–0.83	0.76	0.72–0.81	1.28	1.19–1.37	1.06	0.98–1.14
Other	1.10	1.03–1.18	1.00	0.94–1.08	1.48	1.33–1.64	1.21	1.09–1.35
Component								
Active	1.00	—	1.00	—	1.00	—	1.00	—
Reserve	1.46	1.38–1.54	1.27	1.20–1.35	1.59	1.48–1.72	1.29	1.20–1.40



was deployed or not deployed or whether he was assigned a Combat Arms MOS. Psychiatric and neurological disability evaluation was more common in deployed Combat Arms Soldiers, and these Soldiers were also more likely to have been evaluated for conditions compatible with combat exposures, including PTSD, residuals of TBI, and paralysis. These differences were not observed among Soldiers without a history of deployment.

Strengths of this study include the large study population and complete data capture of disability, demographic, service-related, and deployment characteristics. This study's most serious limitation is that it only considers individuals who were evaluated for disability, and therefore, only limited conclusions can be drawn with respect to the larger Army population or other military services. Other limitations include the restriction of the study population to men, as women have historically been excluded from Combat Arms MOS, and incomplete information on deployment characteristics, such as multiple deployments or deployment length. In addition, interpretation of VASRD codes in this study may be limited because they are generally considered nonspecific, especially for musculoskeletal disorders, and are not directly linked to an ICD-9 diagnosis.<sup>22</sup> Nonetheless, these analyses do indicate that deployed Combat Arms Soldiers are substantially and significantly more likely to be disability retired than Other MOS Soldiers, and that they are more likely to have disabling conditions potentially associated with combat experiences.

Consistent with previous examination of psychiatric disability,<sup>9</sup> this study found that Soldiers with a history of deployment had much higher rates of psychiatric disability compared to those who had never deployed. However, this study adds that PTSD was the most common psychiatric disability in deployed Soldiers and that among deployed men, those with Combat Arms MOS had significantly higher rates of PTSD-related disability compared to Other MOS. A previous study of disability retired Soldiers also found that those in Combat Arms MOS were at higher risk for disability retirement, but that study was limited to a subgroup analysis within a larger study and only included individuals disability retired through 2006.<sup>18</sup> The current study adds to these findings by providing contemporary evidence that Combat Arms MOS is a significant and substantial risk factor for disability retirement primarily among deployed men, examining the entire male disability population and extending the study period through 2011 to include a larger proportion of those who were disabled subsequent to the recent military conflicts.

As described in prior studies, this study found that musculoskeletal disabilities, back-related conditions in particular, were the most frequent conditions evaluated for disability in the U.S. Army.<sup>3-5</sup> Musculoskeletal conditions were the most prevalent disabilities both in deployed and nondeployed Soldiers as well as in Combat Arms and Other MOS. Rates of disability evaluation for musculoskeletal conditions were

also similar regardless of deployment history or whether a Combat Arms MOS was assigned. These findings indicate that the relationship between musculoskeletal disability, MOS, combat exposure, and deployment may be more complex than the clear associations observed between MOS, combat exposure, deployment, and psychiatric or neurological comorbidity in this and other studies.<sup>9,10,15,16,23,26-29</sup> Further research is necessary to determine the precise relationship between deployment, MOS, and the most common musculoskeletal disability conditions.

This cross-sectional study indicates that there is an increased risk of disability retirement among Combat Arms deployers, likely because of combat exposures. This conclusion is supported by the findings that PTSD and TBI comorbidity as well as the determination of disability combat-relatedness were more common among Combat Arms deployed personnel. The slightly increased risk of medical retirement among nondeployed Combat Arms Soldiers may be a result of more intense and physically demanding basic training experiences. In 2008 and 2009, several congressional mandates established improved identification and compensation for service members with TBI and PTSD.<sup>30</sup> It is possible that these new procedures explain the increased risk of disability among deployers found in this study, in contrast to earlier research,<sup>18</sup> and may contribute to the increasing rates of PTSD and TBI disability among deployed Combat Arms Soldiers.

Further research is needed to determine conclusively the risk factors for disability in U.S. Army personnel following the conflicts in Iraq and Afghanistan, including identification of specific military occupations most at risk for disability retirement, investigation of the effects of multiple deployments and deployment length, and studies of other military services, to improve disability evaluation, compensation, and prevention among both deployers and nondeployers. Based on the findings from this study, prospective studies could be designed to examine postmilitary health and lifestyle outcomes in disabled military populations, emphasizing the effects of deployment-related conditions. Although rates of disability evaluation have decreased in recent years,<sup>24,25</sup> PTSD disability retirement has become increasingly more common since 2005.<sup>10</sup> Deployment to combat zones has been shown to be associated with psychiatric disability overall and PTSD disability retirement in particular.<sup>9</sup> In the context of this previous psychiatric disability research, the current report suggests that Combat Arms Soldiers with a history of deployment, who are at increased risk of disability retirement because of combat exposures, are an important population for targeted intervention. Further study is necessary to determine whether interventions targeted to specific Combat Arms MOS would decrease the burden of psychiatric and neurological disability in this population and to assess whether decreases in the frequency or duration of deployment can mitigate disability among Soldiers with a Combat Arms MOS.

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## REFERENCES

- Bell NS, Schwartz CE, Harford TC, Hollander IE, Amoroso PJ: The changing profile of disability in the U.S. Army: 1981–2005. *Disabil Health J* 2008; 1(1): 14–24.
- Bell NS, Schwartz CE, Harford TC, Hollander IE, Amoroso PJ: Temporal changes in the nature of disability: U.S. Army soldiers discharged with disability, 1981–2005. *Disabil Health J* 2008; 1: 163–71.
- Amoroso PJ, Yore MM, Weyandt B, Jones BH: Chapter 8. Total Army injury and health outcomes database: a model comprehensive research database. *Mil Med* 1999; 164(8 Suppl): 1–36.
- Feuerstein M, Berkowitz SM, Peck CA Jr: Musculoskeletal-related disability in US Army personnel: prevalence, gender, and military occupational specialties. *J Occup Environ Med* 1997; 39(1): 68–78.
- Berkowitz SM, Feuerstein M, Lopez MS, Peck CA Jr: Occupational back disability in U.S. Army personnel. *Mil Med* 1999; 164(6): 412–8.
- Hollander IE, Bell NS: Physically demanding jobs and occupational injury and disability in the U.S. Army. *Mil Med* 2010; 175(10): 705–12.
- Songer TJ, LaPorte RE: Disabilities due to injury in the military. *Am J Prev Med* 2000; 18(3 Suppl): 33–40.
- Niebuhr DW, Gubata ME, Cowan DN, et al: Accession Medical Standards Analysis and Research Activity (AMSARA) Annual Report 2011. Silver Spring, MD, Walter Reed Army Institute of Research, 2012. Available at [http://www.amsara.amedd.army.mil/Documents/AMSARA\\_AR/AMSARA\\_AR\\_2011.pdf](http://www.amsara.amedd.army.mil/Documents/AMSARA_AR/AMSARA_AR_2011.pdf); accessed December 27, 2012.
- Bell NS, Hunt PR, Harford TC, Kay A: Deployment to a combat zone and other risk factors for mental health-related disability discharge from the U.S. Army: 1994–2007. *J Trauma Stress* 2011; 24(1): 34–43.
- Packnett ER, Gubata ME, Cowan DN, Niebuhr DW: Temporal trends in the epidemiology of disabilities related to posttraumatic stress disorder in the U.S. Army and Marine Corps from 2005–2010. *J Trauma Stress* 2012; 5: 485–93.
- Armed Forces Health Surveillance Center. Update: deployment health assessments, U.S. Armed Forces, November 2009. *MSMR* 2009; 15(4): 14–15.
- Armed Forces Health Surveillance Center. Update: pre- and post-deployment health assessments, U.S. Armed Forces, January 2003–December 2006. *MSMR* 2007; 13(1): 15–19.
- Brundage JF, Kohlhasse KF, Gambel JM: Hospitalization experiences of US service members before, during, and after participation in peace-keeping operations in Bosnia-Herzegovina. *Am J Ind Med* 2002; 41(4): 279–84.
- Knapik JJ, Spiess A, Grier T, et al: Injuries before and after deployments to Afghanistan and Iraq. *Public Health* 2012; 126(6): 498–506.
- Larson GE, Highfill-McRoy RM, Booth-Kewley S: Psychiatric diagnoses in historic and contemporary military cohorts: combat deployment and the healthy warrior effect. *Am J Epidemiol* 2008; 167(11): 1269–76.
- Wilson J, Jones M, Fear NT, et al: Is previous psychological health associated with the likelihood of Iraq War deployment? An investigation of the “healthy warrior effect.” *Am J Epidemiol* 2009; 169(11): 1362–9.
- Department of the Army: Army Pamphlet 611-21: Personnel Selection and Classification: Military Occupational Classification Structure. Washington, DC, Department of the Army, 1999. Available at <http://www4.army.mil/FA40/files/downloads/00009.pdf>; accessed November 20, 2012.
- Niebuhr DW, Krampf RL, Mayo JA, Blandford CD, Levin LI, Cowan DN: Risk factors for disability retirement among healthy adults joining the U.S. Army. *Mil Med* 2011; 176: 170–5.
- Under Secretary of Defense, Personnel and Readiness: Department of Defense Instruction 1332.38: Physical Disability Evaluation. Washington, DC, Department of Defense, 1996. Available at <http://www.dtic.mil/whs/directives/corres/pdf/133238p.pdf>; accessed November 20, 2012.
- Department of the Army. Army Regulation 635-40: Personnel Separations—Physical Evaluation for Retention, Retirement, or Separation. Washington, DC, Department of the Army, 2012. Available at [http://www.apd.army.mil/pdf/af635\\_40.pdf](http://www.apd.army.mil/pdf/af635_40.pdf); accessed November 20, 2012.
- United States Code. Title 38, Chapter 1, Part 4: Schedule for Rating Disabilities. Washington, DC, U.S. Government Printing Office, 2011. Available at <http://www.gpo.gov/fdsys/pkg/CFR-2011-title38-vol1/pdf/CFR-2011-title38-vol1.pdf>; accessed December 27, 2012.
- Bell NS, Hollander IE, Williams JO, Amoroso PJ: A tale of two disability coding systems: the Veterans Administration Schedule for Rating Disabilities (VASRD) vs. diagnostic coding using the International Classification of Diseases, 9th edition, clinical modification (ICD-9-CM). Natick, MA, US Army Research Institute of Environmental Medicine, 2008. Available at <http://www.dtic.mil/dtic/tr/fulltext/u2/a476409.pdf>; accessed January 24, 2013.
- Hoge CW, Toboni HE, Messer SC, Bell N, Amoroso P, Orman DT: The occupational burden of mental disorders in the U.S. military: psychiatric hospitalizations, involuntary separations, and disability. *Am J Psychiatry* 2005; 162(3): 585–91.
- Gubata ME, Niebuhr DW, Cowan DN, Packnett ER, Blandford CD, Piccirillo AL: Tri-service disability evaluation systems database analysis and research. Annual Report 2011. Silver Spring, MD, Walter Reed Army Institute of Research; 2012. Available at <http://www.amsara.amedd.army.mil/DESAR.aspx>; accessed November 28, 2012.
- Niebuhr DW, Gubata ME, Cowan DN, Packnett ER, Blandford CD, Piccirillo AL: Tri-service disability evaluation systems database analysis and research. Annual Report 2010. Silver Spring, MD, Walter Reed Army Institute of Research, 2011. Available at <http://www.amsara.amedd.army.mil/DESAR.aspx>; accessed November 28, 2012.
- Friedman MJ: Veterans’ mental health in the wake of war. *New Eng J Med* 2005; 352(13): 1287–90.
- Hoge CW, Castro CA, Messer SC, McGurk D, Cotting DI, Koffman RL: Combat duty in Iraq and Afghanistan, mental health problems, and barriers to care. *New Eng J Med* 2004; 351(1): 13–22.
- Hoge CW, Auchterlonie JL, Milliken CS: Mental health problems, use of mental health services, and attrition from military service after returning from deployment to Iraq or Afghanistan. *JAMA* 2006; 295(9): 1023–32.
- Hoge CW, Terhakopian A, Castro CA, Messer SC, Engel CC: Association of posttraumatic stress disorder with somatic symptoms, health care visits, and absenteeism among Iraq war veterans. *Am J Psychiatry* 2007; 164(1): 150–3.
- Under Secretary of Defense, Personnel and Readiness: Policy memorandum on implementing disability-related provisions of the National Defense Authorization Act of 2008, Washington, DC, Department of Defense, 2008. Available at <http://prhome.defense.gov/WWCTP/docs/NDAA%2008%202%20PM%20sm.pdf>; accessed December 27, 2012.